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Hosaka et al.

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(45) **Date of Patent: Oct. 13, 2015**

(54) **HANDWRITING INPUT DEVICE AND HANDWRITING INPUT CONTROL PROGRAM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 205 days.

(21) Appl. No.: **13/659,214**

(22) Filed: **Oct. 24, 2012**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
G06F 3/0488 (2013.01)
G06F 9/44 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/0488*** (2013.01); ***G06F 9/4443*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/0488
See application file for complete search history.

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Japanese Office Action (Notice of Reasons for Refusal) dated Oct. 18, 2013, issued by the Japanese Patent Office in corresponding Japanese Patent Application No. 2011-240853, and English language translation of Office Action. (5 pages).

* cited by examiner

Primary Examiner — Jason Olson
(74) *Attorney, Agent, or Firm* — Buchanan Ingersoll & Rooney PC

(57) **ABSTRACT**

A handwriting input device in which a handwriting input is possible to a touch panel which is superimposed on a display screen including: an inputted contents processing section for recognizing a content by the handwriting input and setting up a area on the display screen based on an recognition result; an application software determining section for determining an application software which should be started up based on the recognition result and starting up the application software; and a result processing section for inserting information acquired by the started application software into the area and displaying on the display screen.

8 Claims, 16 Drawing Sheets

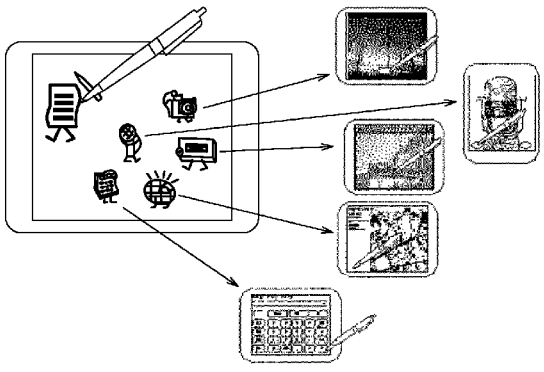


FIG. 1a

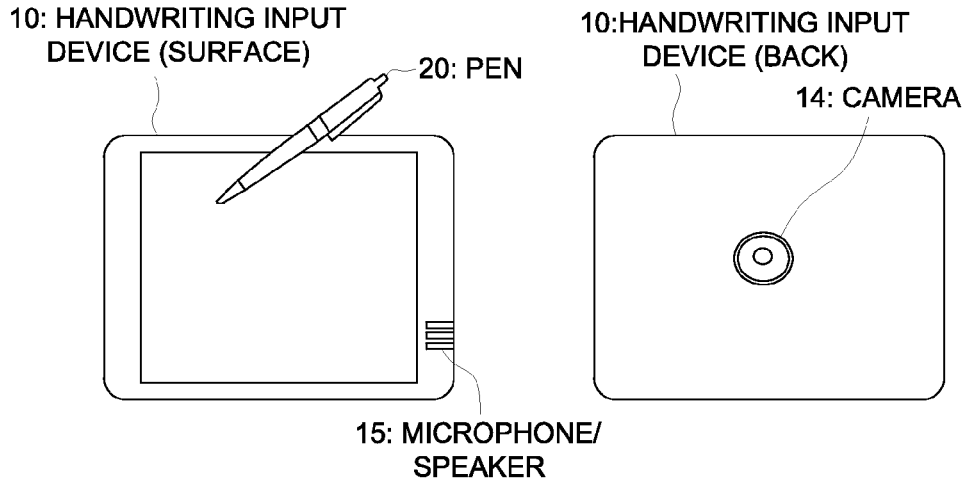


FIG. 1b

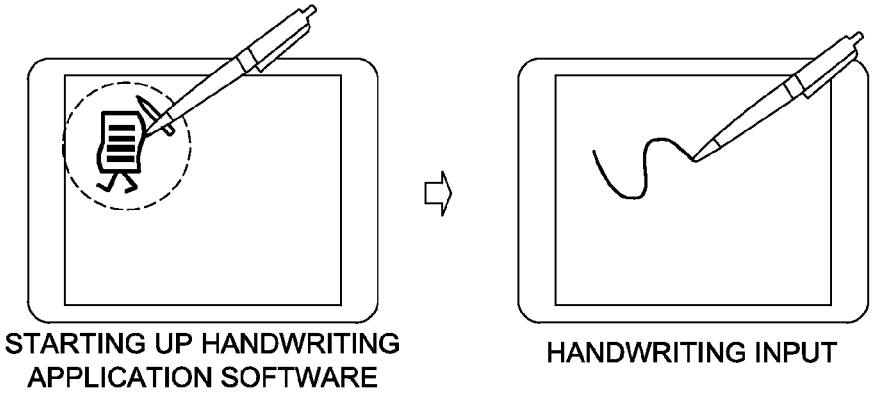


FIG. 1c

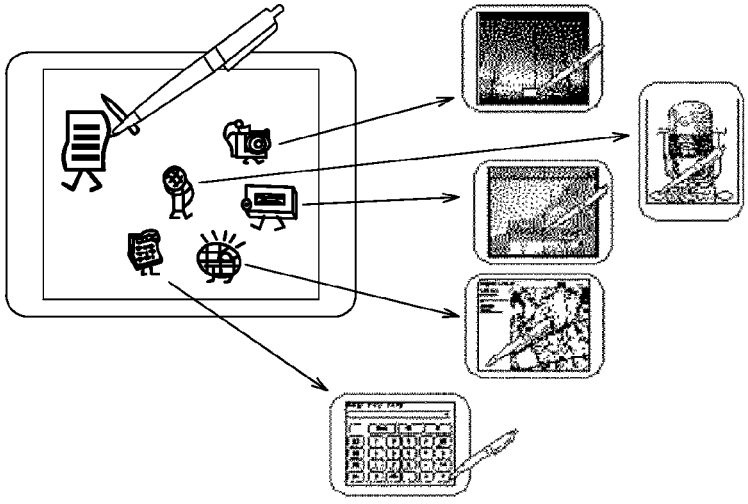


FIG. 2

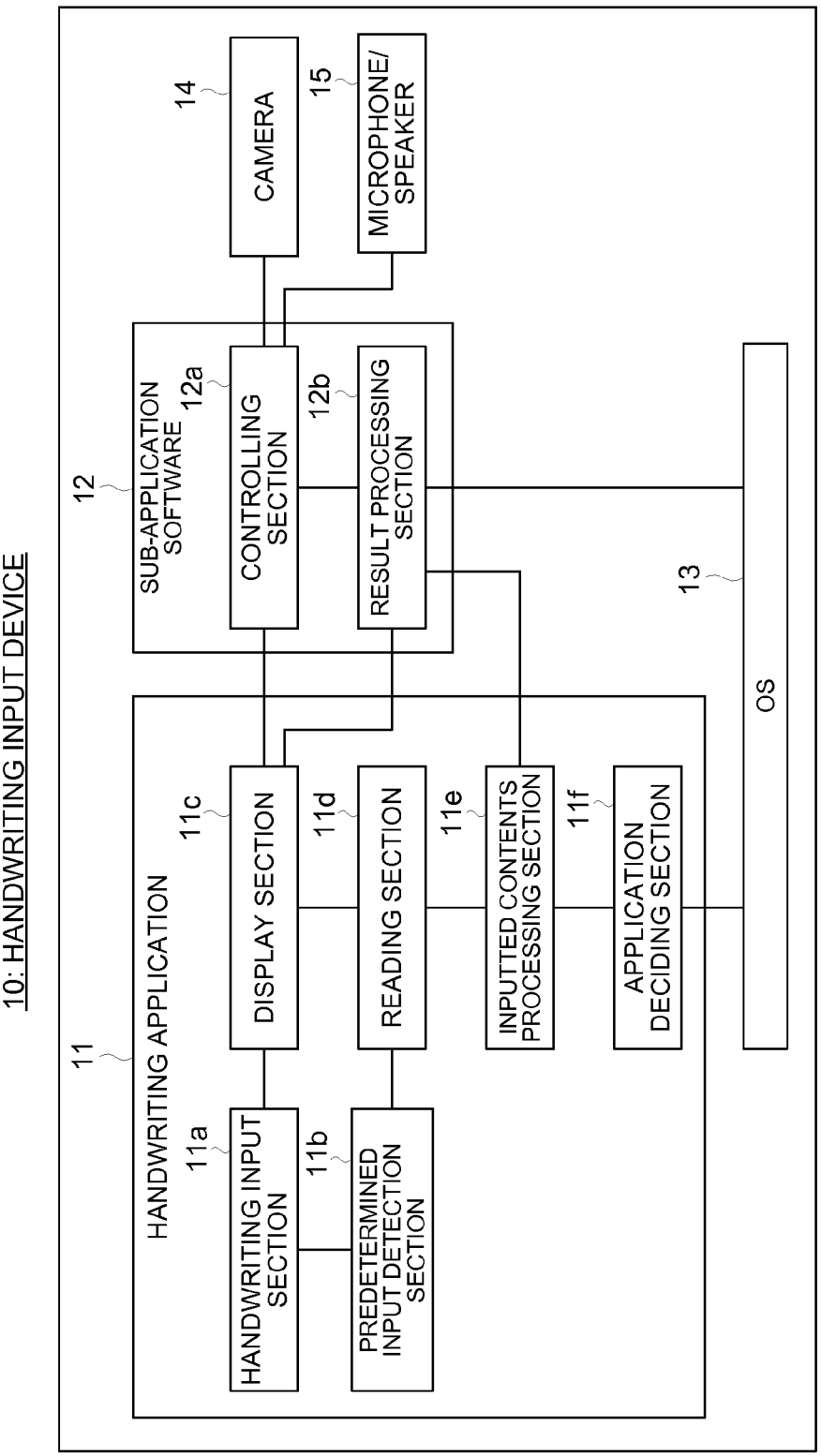

10: HANDWRITING INPUT DEVICE
11
HANDWRITING APPLICATION
11a
HANDWRITING INPUT SECTION
11b
PREDETERMINED INPUT DETECTION SECTION
11c
DISPLAY SECTION
11d
READING SECTION
11e
INPUTTED CONTENTS PROCESSING SECTION
11f
APPLICATION DECIDING SECTION
12
SUB-APPLICATION SOFTWARE
12a
CONTROLLING SECTION
12b
RESULT PROCESSING SECTION
13
OS
14
CAMERA
15
MICROPHONE/ SPEAKER

FIG. 3

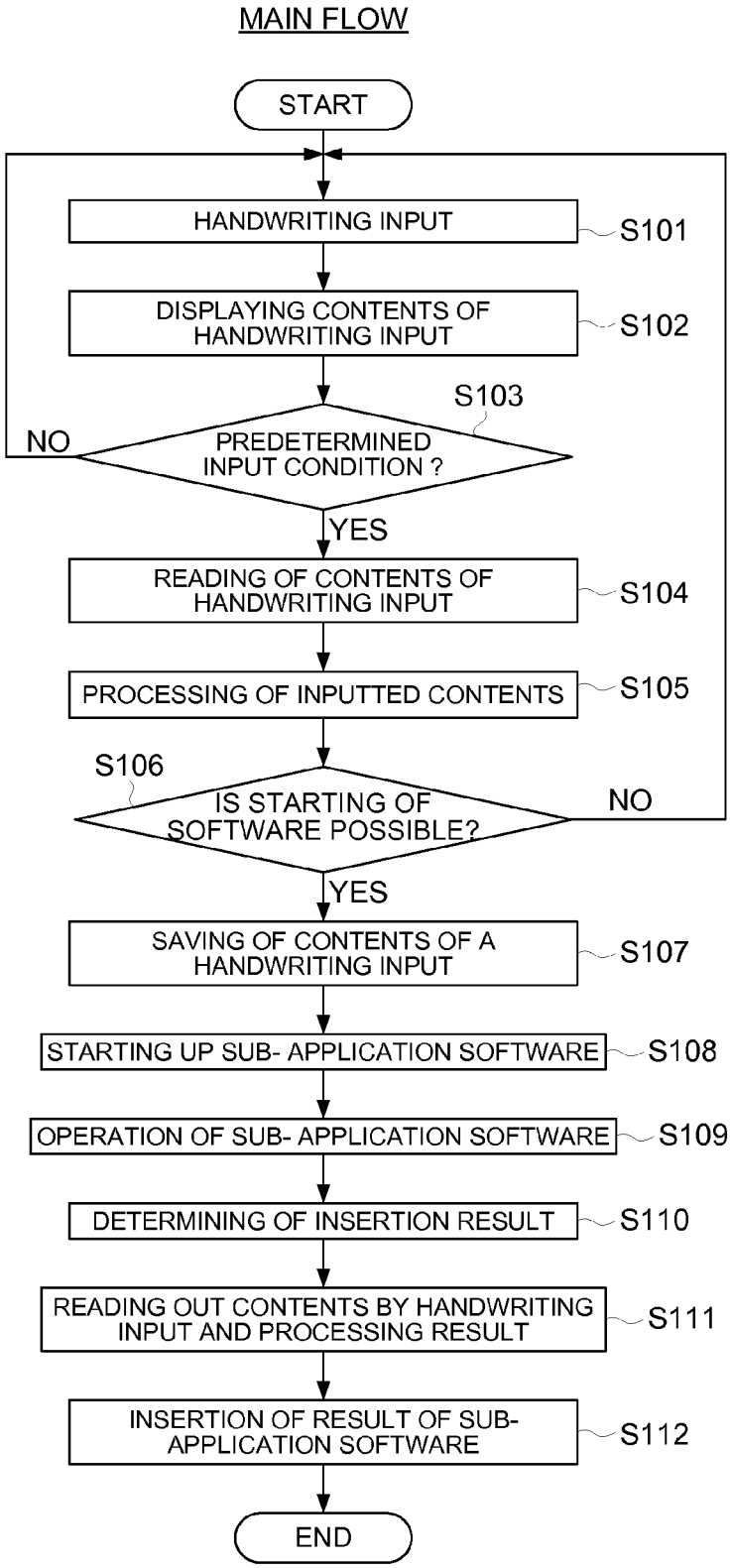

MAIN FLOW
START
HANDWRITING INPUT
S101
DISPLAYING CONTENTS OF HANDWRITING INPUT
S102
S103
PREDETERMINED INPUT CONDITION ?
NO
YES
READING OF CONTENTS OF HANDWRITING INPUT
S104
PROCESSING OF INPUTTED CONTENTS
S105
S106
IS STARTING OF SOFTWARE POSSIBLE?
NO
YES
SAVING OF CONTENTS OF A HANDWRITING INPUT
S107
STARTING UP SUB- APPLICATION SOFTWARE
S108
OPERATION OF SUB- APPLICATION SOFTWARE
S109
DETERMINING OF INSERTION RESULT
S110
READING OUT CONTENTS BY HANDWRITING INPUT AND PROCESSING RESULT
S111
INSERTION OF RESULT OF SUB-APPLICATION SOFTWARE
S112
END

FIG. 4

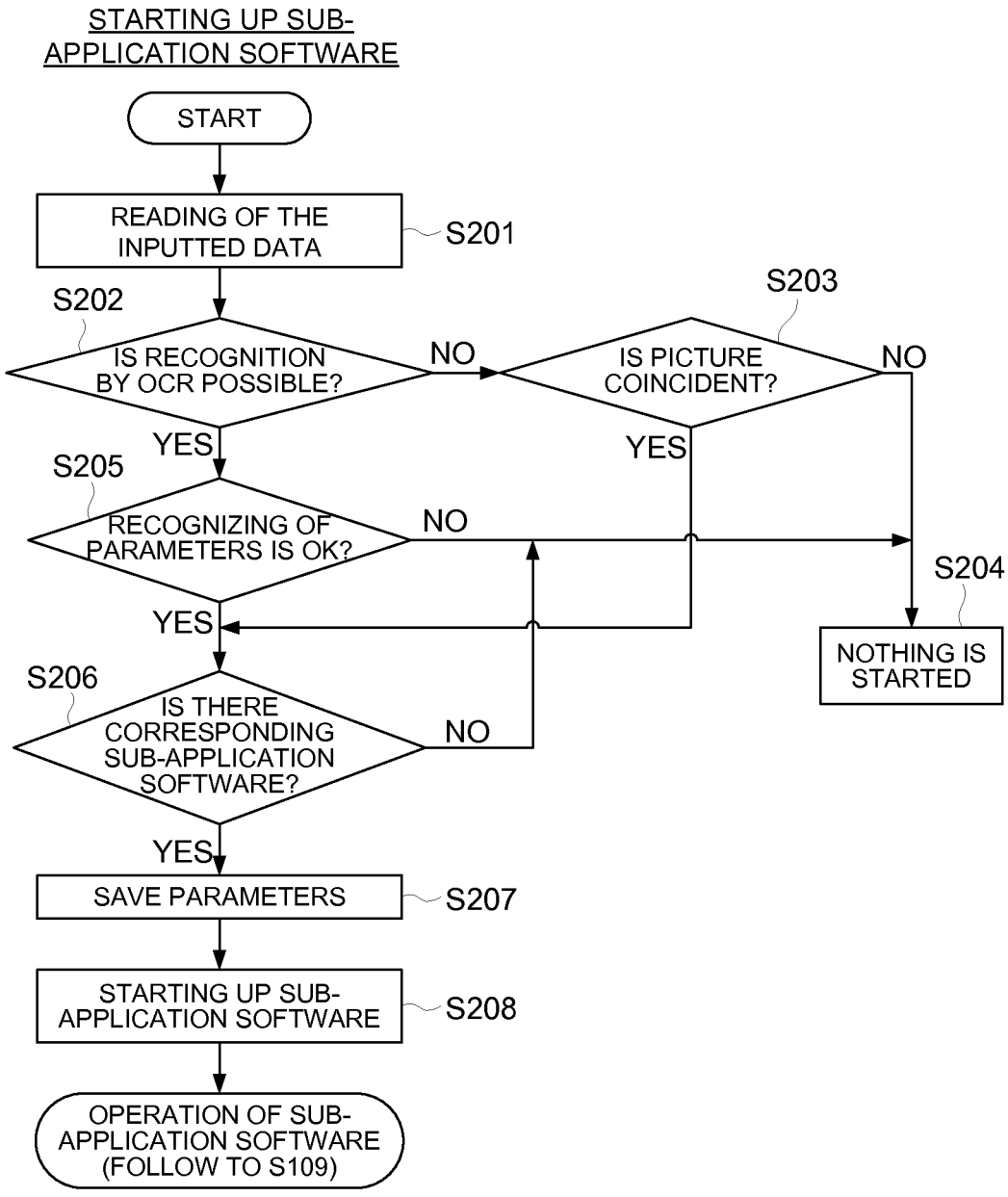

STARTING UP SUB-APPLICATION SOFTWARE
START
READING OF THE INPUTTED DATA
S201
S202
IS RECOGNITION BY OCR POSSIBLE?
NO
S203
IS PICTURE COINCIDENT?
NO
YES
YES
S205
RECOGNIZING OF PARAMETERS IS OK?
NO
S204
NOTHING IS STARTED
YES
S206
IS THERE CORRESPONDING SUB-APPLICATION SOFTWARE?
NO
YES
SAVE PARAMETERS
S207
STARTING UP SUB-APPLICATION SOFTWARE
S208
OPERATION OF SUB-APPLICATION SOFTWARE (FOLLOW TO S109)

FIG. 5a

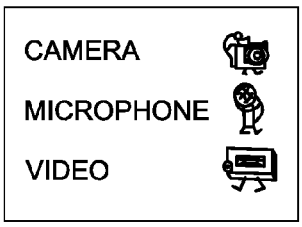


FIG. 5b

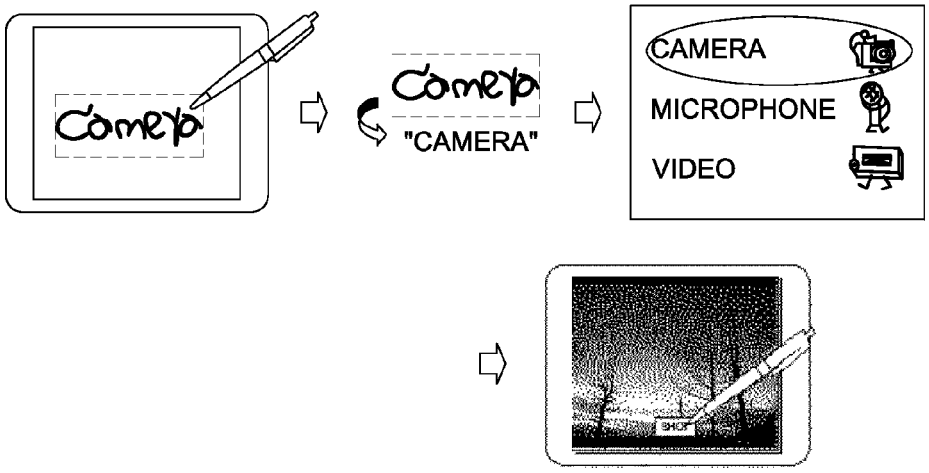


FIG. 5c

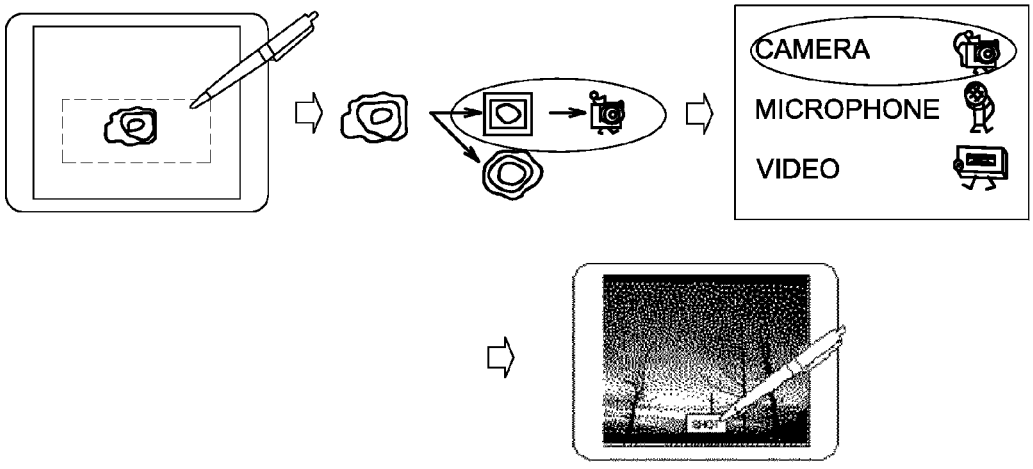


FIG. 6

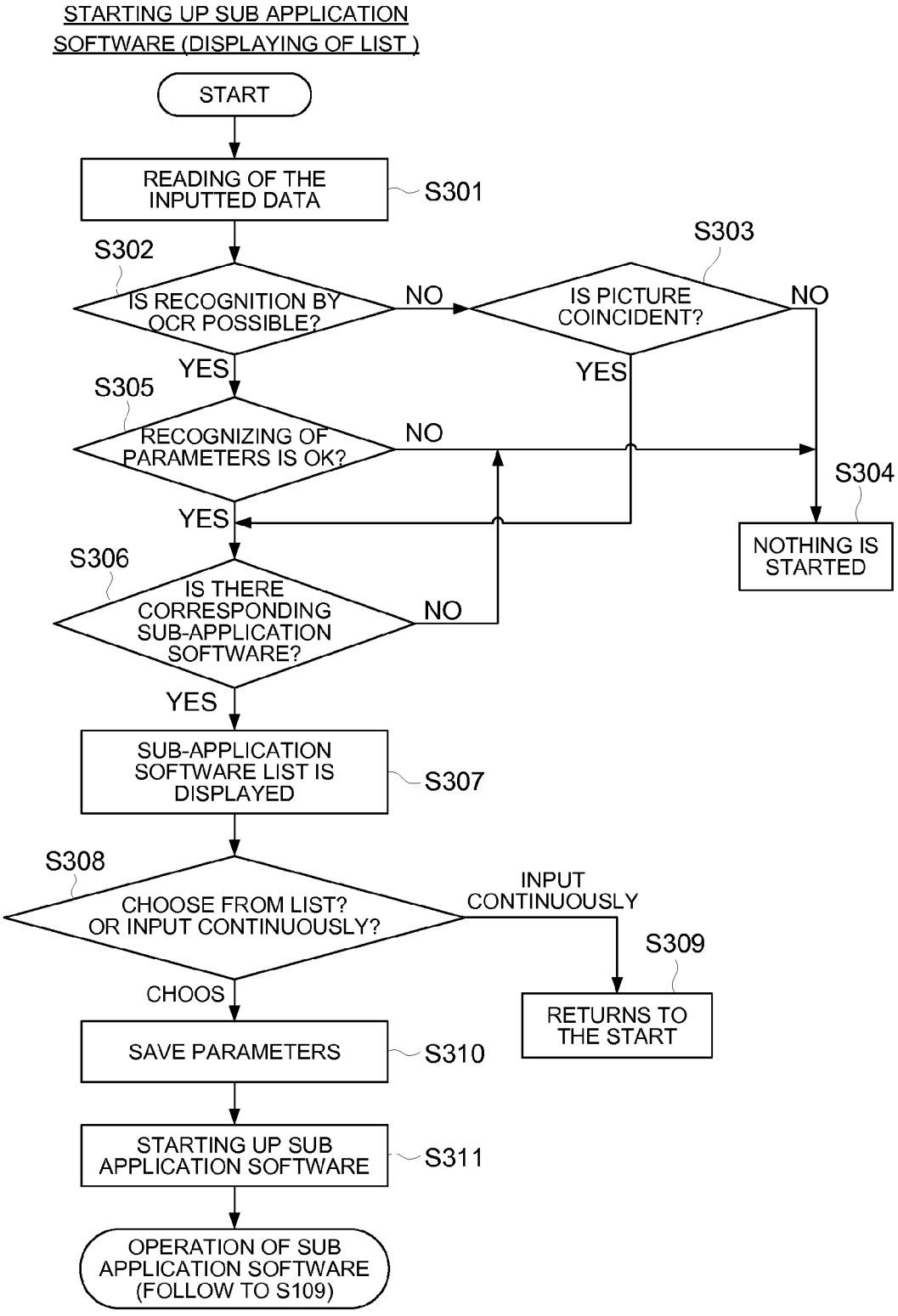

STARTING UP SUB APPLICATION SOFTWARE (DISPLAYING OF LIST)
START
READING OF THE INPUTTED DATA
S301
S302
IS RECOGNITION BY OCR POSSIBLE?
NO
S303
IS PICTURE COINCIDENT?
NO
YES
YES
S305
RECOGNIZING OF PARAMETERS IS OK?
NO
S304
NOTHING IS STARTED
YES
S306
IS THERE CORRESPONDING SUB-APPLICATION SOFTWARE?
NO
YES
SUB-APPLICATION SOFTWARE LIST IS DISPLAYED
S307
S308
CHOOSE FROM LIST? OR INPUT CONTINUOUSLY?
INPUT CONTINUOUSLY
S309
RETURNS TO THE START
CHOOS
SAVE PARAMETERS
S310
STARTING UP SUB APPLICATION SOFTWARE
S311
OPERATION OF SUB APPLICATION SOFTWARE (FOLLOW TO S109)

FIG. 7

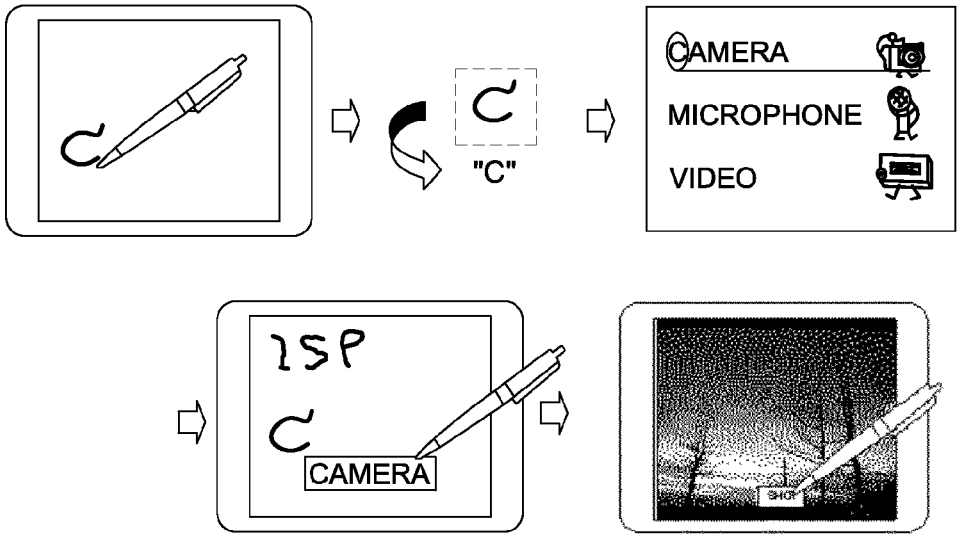


FIG. 8

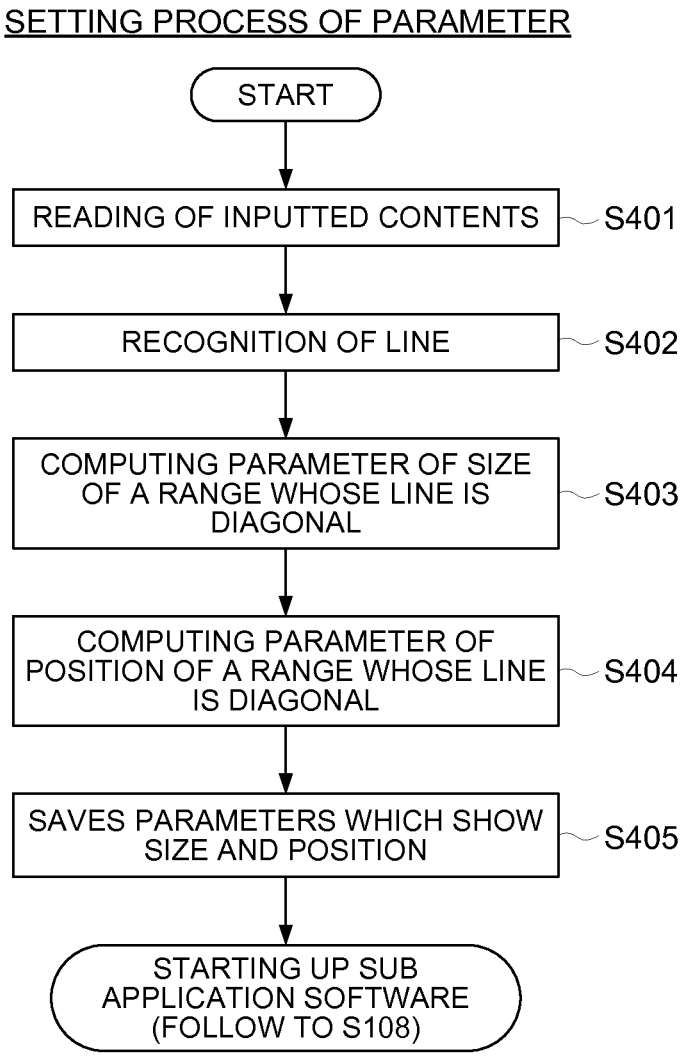

SETTING PROCESS OF PARAMETER
START
READING OF INPUTTED CONTENTS
S401
RECOGNITION OF LINE
S402
COMPUTING PARAMETER OF SIZE OF A RANGE WHOSE LINE IS DIAGONAL
S403
COMPUTING PARAMETER OF POSITION OF A RANGE WHOSE LINE IS DIAGONAL
S404
SAVES PARAMETERS WHICH SHOW SIZE AND POSITION
S405
STARTING UP SUB APPLICATION SOFTWARE (FOLLOW TO S108)

FIG. 9

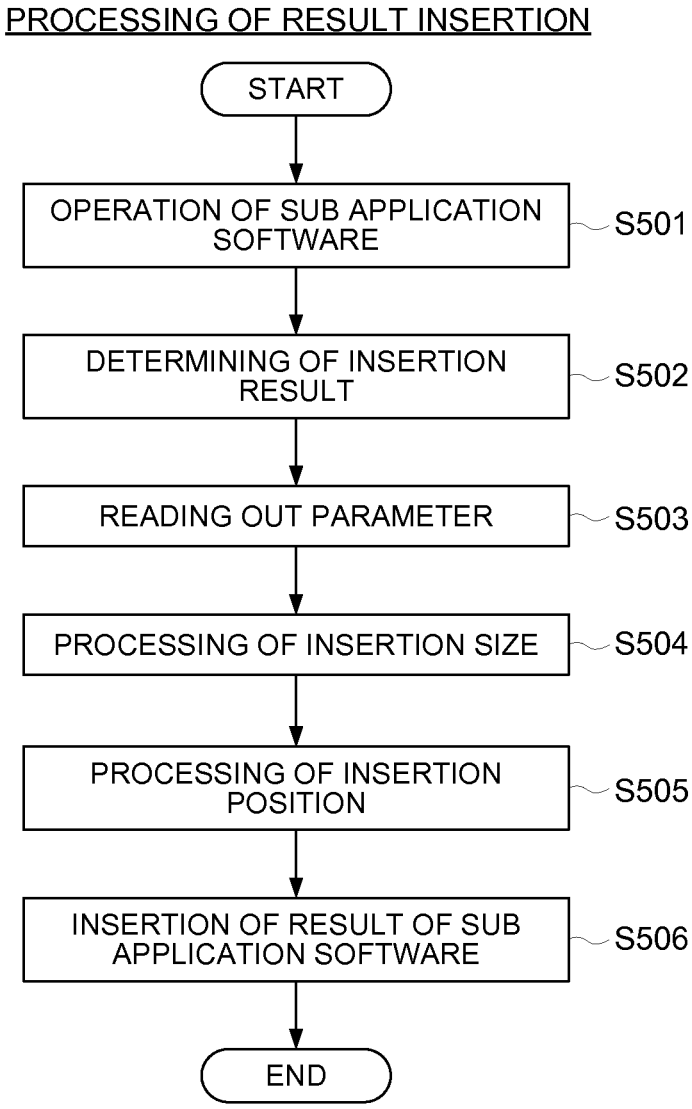

PROCESSING OF RESULT INSERTION
START
OPERATION OF SUB APPLICATION SOFTWARE
S501
DETERMINING OF INSERTION RESULT
S502
READING OUT PARAMETER
S503
PROCESSING OF INSERTION SIZE
S504
PROCESSING OF INSERTION POSITION
S505
INSERTION OF RESULT OF SUB APPLICATION SOFTWARE
S506
END

FIG. 10a

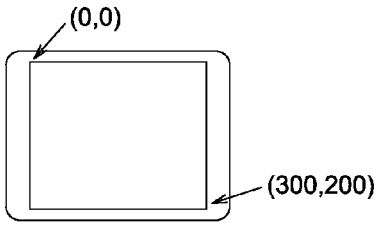


FIG. 10b

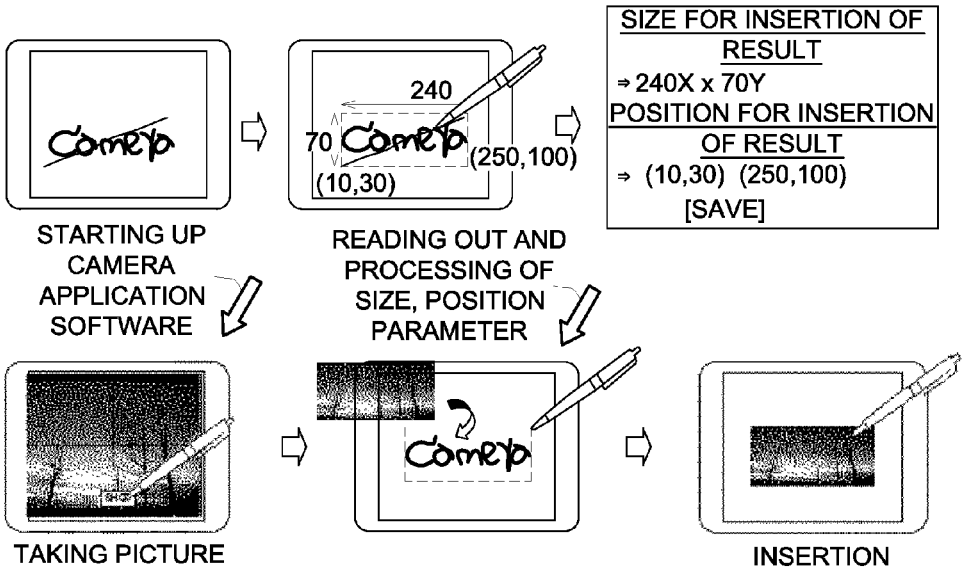


FIG. 10c

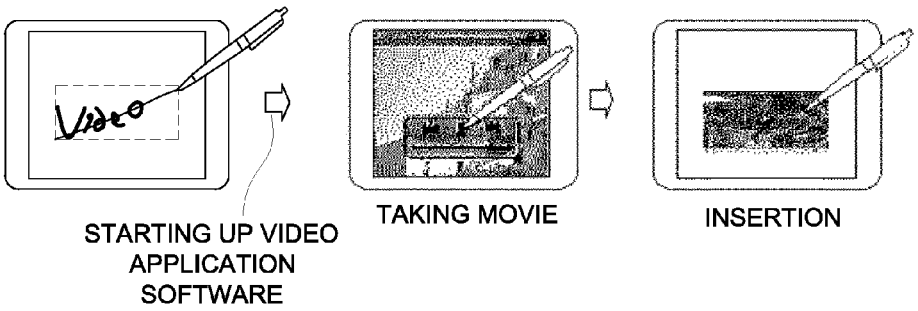


FIG. 10d

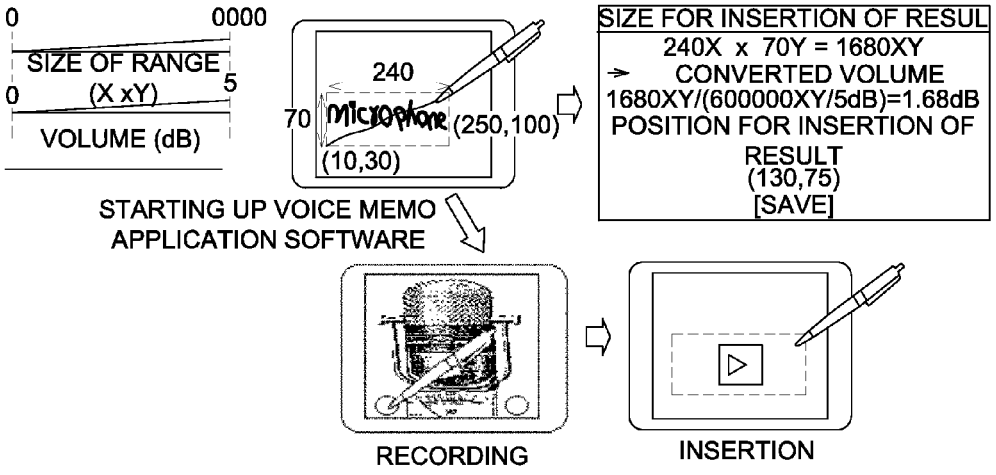


FIG. 10e

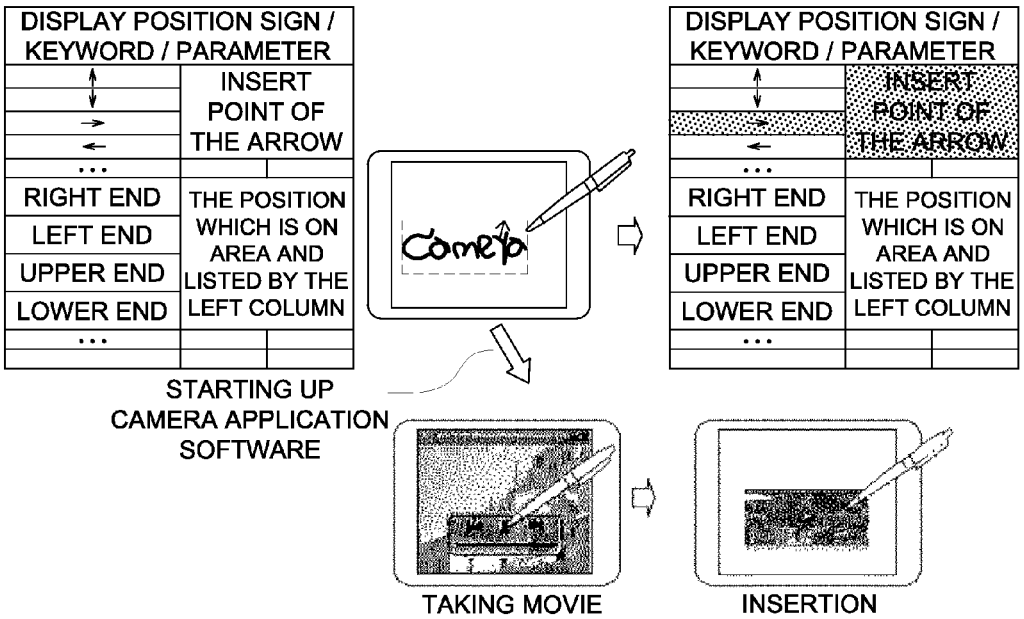


FIG. 11

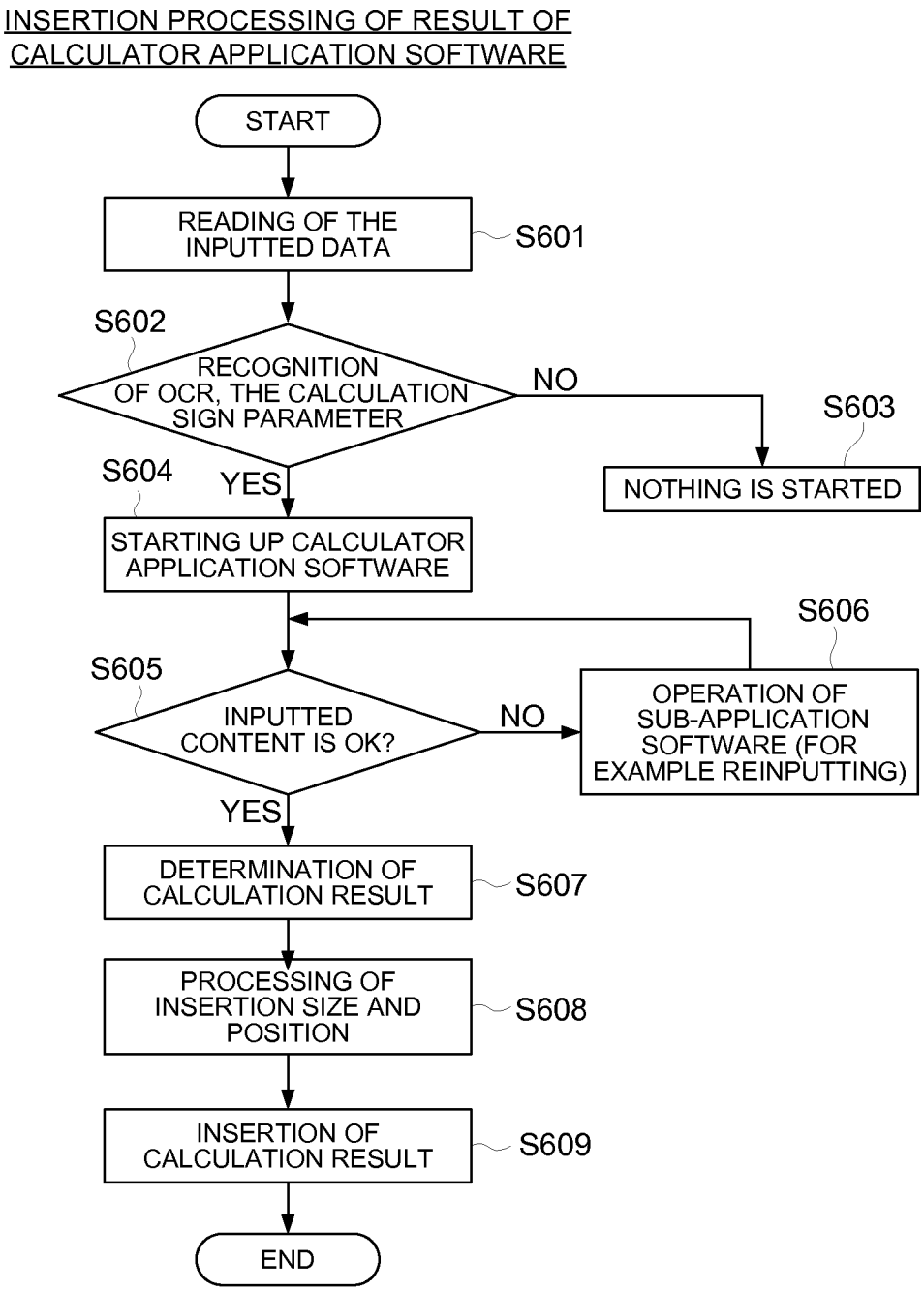

INSERTION PROCESSING OF RESULT OF CALCULATOR APPLICATION SOFTWARE
START
READING OF THE INPUTTED DATA
S601
S602
RECOGNITION OF OCR, THE CALCULATION SIGN PARAMETER
NO
S603
NOTHING IS STARTED
S604
YES
STARTING UP CALCULATOR APPLICATION SOFTWARE
S606
S605
INPUTTED CONTENT IS OK?
NO
OPERATION OF SUB-APPLICATION SOFTWARE (FOR EXAMPLE REINPUTTING)
YES
DETERMINATION OF CALCULATION RESULT
S607
PROCESSING OF INSERTION SIZE AND POSITION
S608
INSERTION OF CALCULATION RESULT
S609
END

FIG. 12

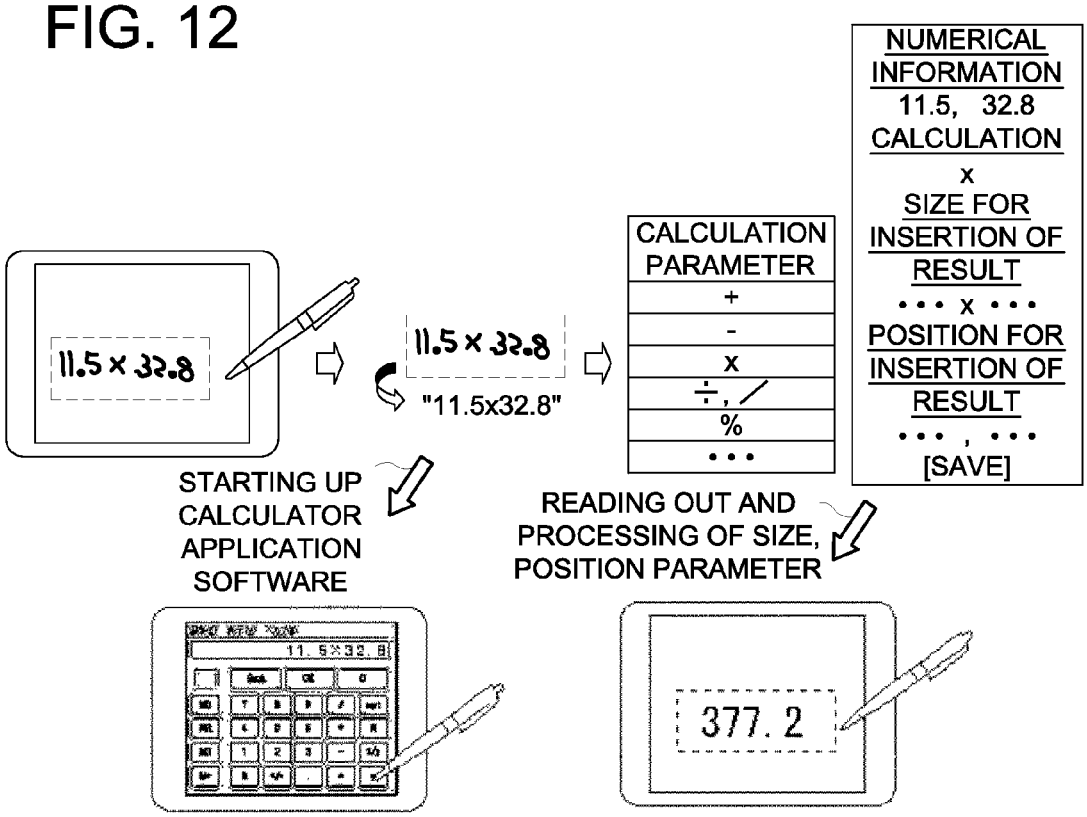

11.5 × 32.8
11.5 × 32.8
"11.5x32.8"
CALCULATION PARAMETER
+
-
x
÷, /
%
• • •
NUMERICAL INFORMATION
11.5, 32.8
CALCULATION
x
SIZE FOR INSERTION OF RESULT
• • • x • • •
POSITION FOR INSERTION OF RESULT
• • • , • • •
[SAVE]
STARTING UP CALCULATOR APPLICATION SOFTWARE
READING OUT AND PROCESSING OF SIZE, POSITION PARAMETER
377. 2

FIG. 13

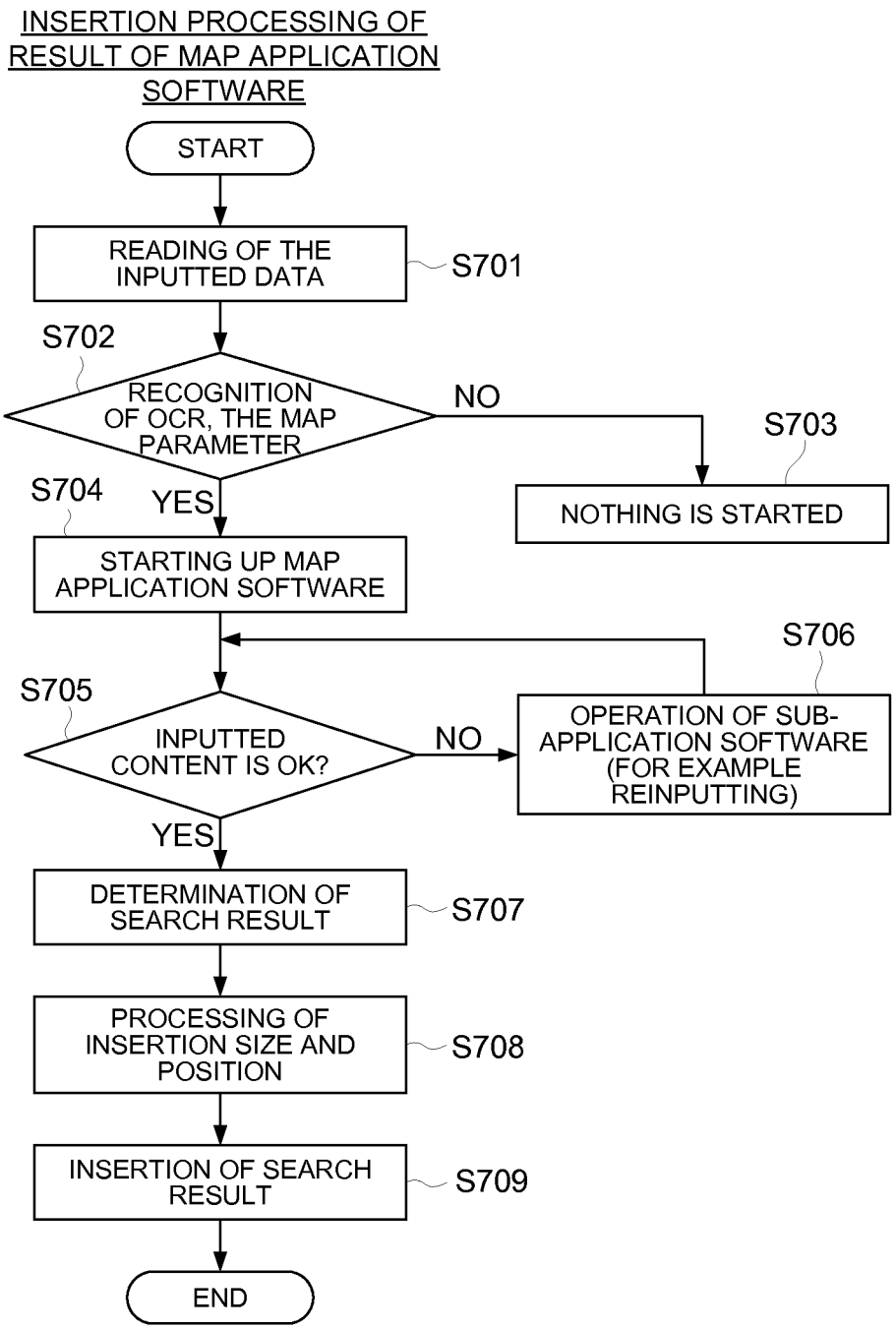

INSERTION PROCESSING OF RESULT OF MAP APPLICATION SOFTWARE
START
READING OF THE INPUTTED DATA
S701
S702
RECOGNITION OF OCR, THE MAP PARAMETER
NO
S703
NOTHING IS STARTED
S704
YES
STARTING UP MAP APPLICATION SOFTWARE
S706
S705
INPUTTED CONTENT IS OK?
NO
OPERATION OF SUB-APPLICATION SOFTWARE (FOR EXAMPLE REINPUTTING)
YES
DETERMINATION OF SEARCH RESULT
S707
PROCESSING OF INSERTION SIZE AND POSITION
S708
INSERTION OF SEARCH RESULT
S709
END

FIG. 14

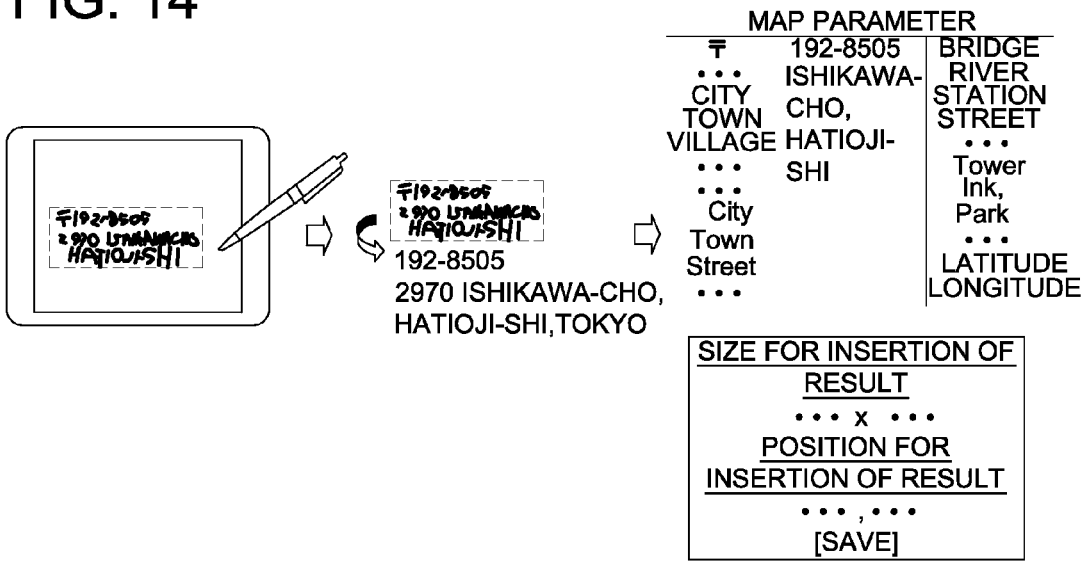

192-8505
2970 ISHIKAWA-CHO,
HATIOJI-SHI,TOKYO
MAP PARAMETER
〒 192-8505
CITY ISHIKAWA-
TOWN CHO,
VILLAGE HATIOJI-
SHI
City
Town
Street
BRIDGE
RIVER
STATION
STREET
Tower
Ink,
Park
LATITUDE
LONGITUDE
SIZE FOR INSERTION OF RESULT
x
POSITION FOR INSERTION OF RESULT
[SAVE]
DETERMINING OF INSERTION OF RESULT (INSERTION OF MAP)

FIG. 15

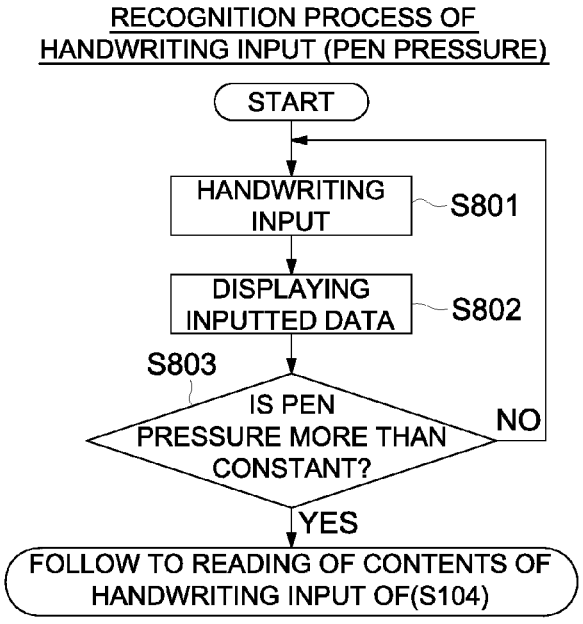

RECOGNITION PROCESS OF HANDWRITING INPUT (PEN PRESSURE)
START
HANDWRITING INPUT
S801
DISPLAYING INPUTTED DATA
S802
S803
IS PEN PRESSURE MORE THAN CONSTANT?
NO
YES
FOLLOW TO READING OF CONTENTS OF HANDWRITING INPUT OF(S104)

FIG. 16

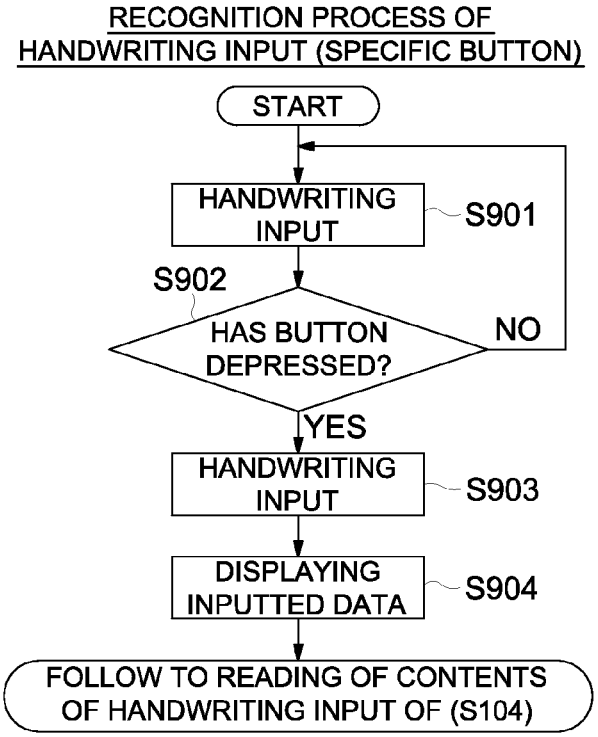


FIG. 17a

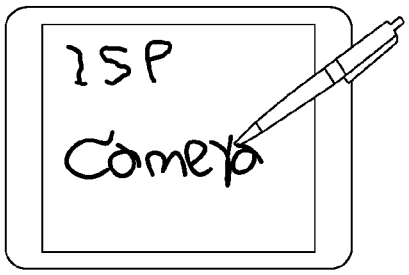
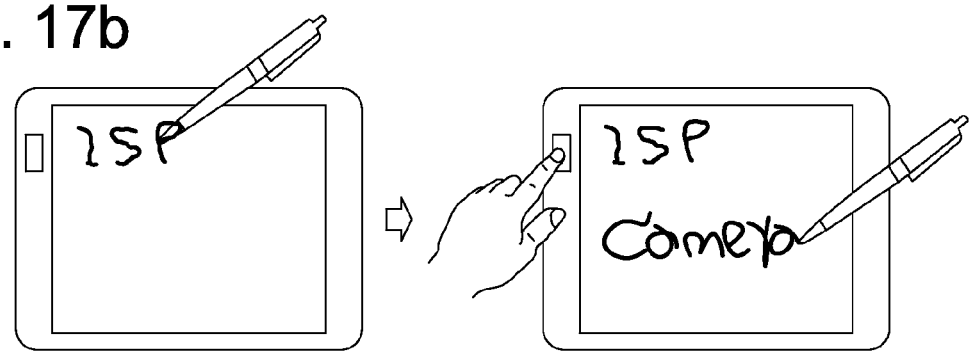


FIG. 17b



HANDWRITING INPUT DEVICE AND HANDWRITING INPUT CONTROL PROGRAM

The present application is based on Patent Application No. 2011-240853 filed at the Japan Patent Office on Nov. 2, 2011 and which is hereby incorporated herein in its entirety.

TECHNICAL FIELD

Present invention is corresponding to the handwriting input device which equipped the handwriting input function within a touch panel, and the handwriting input control program which operates with the device concerned.

BACKGROUND

In recent years, handwriting input devices such as a tablet terminal which equipped the ability to receive and interpret handwriting input, have spread. Various type of such handwriting input devices are equipped with various functions, such as a function for taking still picture and movie by built-in camera, a function for recording sounds by the built-in microphone, a function for searching place on a map, a function as a calculator. With the handwriting input devices, if application software for handwriting input is started up, icons for starling up application software which performs various functions etc. are displayed on the screen for handwriting input, and, desired application software is started up by touching the icon.

Although it is not the technology about the above-mentioned handwriting input device, for example, Unexamined Japanese Patent Application Publication No. 2000-194869 discloses the document creation device, wherein the document creation device processing; recognizing optically frame and character string on paper etc. by handwriting input; incorporating them into personal computer etc.; starting up automatically an application software which processes the data of the statement in frame when the incorporated portion of the frame on the document is specified by cursor; and, attaching the chosen data to the position of the frame when user chose the data for pasting. And, Unexamined Japanese Patent Application Publication No. 2006-119712 discloses the information control terminal device, wherein the information control terminal device processing; starting up the built in camera when pen pressure over a predetermined value is detected in the structure of Anoto Digital Pen; starting the reading of dot pattern of a paper; and, starting the reading the written-in character.

However, in conventional handwriting input device, the user has to do operation of choosing icon for starting up desired application software, copying the information acquired by application software, determining the size and position of a place on which the copied information and pasting it, when inserting the information acquired by application software into the predetermined place of screen for handwriting input, so the operation becomes complicated and was a problem.

In view of the problems described above, it is an object of the present invention to provide a handwriting input device and a handwriting input control program by which starting of application software and use of the information acquired by the application software was simplified.

SUMMARY

1. To achieve at least one of the above mentioned objects, a handwriting input device in which a handwriting input is possible to a touch panel which is superimposed on a display screen reflecting one aspect of the present invention includes an inputted contents processing section for recognizing a content by the handwriting input and setting up a area on the display screen based on an recognition result; an application software determining section for determining an application software which should be started up based on the recognition result and starting up the application software; and a result processing section for inserting information acquired by the started application software into the area and displaying on the display screen.

2. In the abovementioned handwriting input device of item 1, wherein the inputted contents processing section sets up a rectangle area specified by a line inputted by handwriting over a character and/or a figure which is inputted by handwriting, a rectangle area surrounding a character and/or a figure which is inputted by handwriting, or a rectangle area specified by a sign with a character and/or a figure which is inputted by handwriting, as the area.

3. In the abovementioned handwriting input device of item 1, wherein the application software determining section displays a list of application software which is determined based on recognition result on the display screen, and starts application software selected from the list.

4. In the abovementioned handwriting input device of item 1, wherein the result processing section sets up an attribute of the information acquired by the application software according to a size of the area.

5. In the abovementioned handwriting input device of item 4, wherein the attribute of the information comprises at least one of a display size of an image, expansion or reduction magnification of an image, a resolution of an image, a recording time of a movie, and a recording time of a sound.

6. In the abovementioned handwriting input device of item 1, further comprises an input detecting section for detecting a pen pressure by handwriting input or a state where a specific button is depressed, wherein the inputted contents processing section, the application software determining section and the input detecting section are performed, when the pen pressure is higher than a predetermined threshold, when the specific button is depressed, or when handwriting is carried out after the specific button is depressed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1***a* is a diagram showing schematically the appearance composition and basic operations of a handwriting input device concerning an embodiment of the present invention;

FIG. **1***b* is a diagram showing schematically the appearance composition and basic operations of a handwriting input device concerning an embodiment of the present invention;

FIG. **1***c* is a diagram showing schematically the appearance composition and basic operations of a handwriting input device concerning an embodiment of the present invention;

FIG. **2** is a block diagram showing the composition of the main part of a handwriting input device concerning an embodiment of the present invention;

FIG. **3** is a flow chart showing main process of a handwriting input device concerning an embodiment of the present invention;

FIG. **4** is a flow chart showing a process (an example of a starting up process of a sub-application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **5***a* is a diagram showing schematically an example of a starting up process of a sub-application software of a handwriting input device concerning an embodiment of the present invention;

FIG. **5***b* is a diagram showing schematically an example of a starting up process of a sub-application software of a handwriting input device concerning an embodiment of the present invention;

FIG. **5***c* is a diagram showing schematically an example of a starting up process of a sub-application software of a handwriting input device concerning an embodiment of the present invention;

FIG. **6** is a flow chart showing a process (other example of a starting up process of a sub-application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **7** is a diagram showing schematically other example of a starting up process of a sub-application software of a handwriting input device concerning an embodiment of the present invention;

FIG. **8** is a flow chart showing process (an example of a parameter setting process for displaying the information acquired by sub-application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **9** is a flow chart showing process (an example of an inserting process of the information acquired by sub-application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **10***a* is a diagram showing a size of an input of handwriting with a handwriting input device concerning an embodiment of the present invention;

FIG. **10***b* is a diagram showing schematically an inserting process of a still picture which took with camera application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **10***c* is a diagram showing schematically an inserting process of a movie which took with camera application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **10***d* is a diagram showing schematically an inserting process of a recorded sound which recorded with microphone application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **10***e* is diagram showing schematically other example of inserting process of a still picture which took with camera application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **11** is a flow chart showing a process (an example of an inserting process of the result calculated by calculator application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **12** is a diagram showing schematically an inserting process of the result calculated by calculator application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **13** is a flow chart showing a process (an example of an inserting process of a map acquired by map application software) of a handwriting input device concerning an embodiment of the present invention;

FIG. **14** is a diagram showing schematically an inserting process of a map acquired by map application software using a handwriting input device concerning an embodiment of the present invention;

FIG. **15** is a flow chart showing a process (an example of a detecting process of a handwriting input) of a handwriting input device concerning an embodiment of the present invention;

FIG. **16** is a flow chart showing a process (other example of a detecting process of a handwriting input) of a handwriting input device concerning an embodiment of the present invention; and

FIG. **17***a* is a diagram showing schematically a detecting process of a handwriting input using a handwriting input device concerning an embodiment of the present invention.

FIG. **17***b* is a diagram showing schematically a detecting process of a handwriting input using a handwriting input device concerning an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As having explained as a background, it is impossible for the conventional handwriting input device to interlock the application software which processes the handwriting input and the application software which performs various functions prepared for handwriting input device. Therefore, when inserting the information acquired by application software into the predetermined place of screen for handwriting input, the user has to do operation of choosing icon and starts up desired application software, to copy information acquired by the application software, to determine the size and position of a place on which the copied information is pasted, to paste the information in the determined size and position. Such complicated operation is a problem.

Then, the embodiment of the present invention performs that, the sub-application software corresponding to contents of a handwriting input is started when a predetermined handwriting input is detected during application software which makes a handwriting input possible is operated, and inserts the information acquired by the sub-application software into the area corresponding to contents by handwriting input, automatically.

In detailed, if a predetermined handwriting input is detected (for example, pen pressure over a predetermined value is detected, or the handwriting input while the specific button is depressed is detected), contents of a handwriting input (for example, the beforehand regular matter for every sub-application software, such as a character, a rough sketch, a formula, an address, a name which points out the name of a place, latitude, longitude etc.) are interpreted, sub-application software corresponding to the contents of a handwriting input is chosen and started in the handwriting input device which is provided various software which realizes functions such as the application software (main application software) for receiving and interpreting the handwriting input by stylus or a finger, the camera application software for taking still picture or movie, the microphone application software for recording sound, the calculator application software, the map application software for searching a place on a map. And the size and position of the area corresponding to the contents of the handwriting input are determined, and the information acquired by sub-application software is inserted as determined size.

Therefore, three operations performed only by performing a handwriting input, wherein the three operations are related to a starting up of the sub-application software, a determination of area which should inserted the information acquired by sub-application software, and an insertion of the information acquired by sub-application software, as a result, a user's time and effort is saved and its convenience improves.

Embodiments

The handwriting input device and the handwriting input control program concerning one embodiment of the present

invention are described still in detail with reference FIG. **1** from FIG. **17**. FIG. **1** is a diagram showing schematically the appearance composition and basic operations of a handwriting input device concerning the present embodiment, and FIG. **2** is a block diagram showing the composition of the main part of a handwriting input device concerning the present embodiment. Moreover, FIGS. **3**, **4**, **6**, **8**, **9**, **11**, **13**, **15** and **16** are flow charts showing processes of the handwriting input device concerning the present embodiment, and FIG. **5**, **7**, **10**, **12**, **14**, **17** are diagrams showing schematically examples of processes of the handwriting input device concerning the present embodiment.

As shown in FIG. **1**(*a*), the handwriting input device **10** is a tablet terminal, a mobile phone or laptop computer, which receives and interprets the handwriting input by stylus or a finger. And the handwriting input device **10** is provided with camera **14** which takes still picture and movie, microphone and speaker **15** for recording sounds, etc. The stylus is called the pen **20** by the following explanation. In addition, the appearance of handwriting input device **10** should just be composition in which not only the composition of FIG. **1** but handwriting input is possible.

As shown in FIG. **1**(*b*), the screen for handwriting input is displayed and it will be in the state where a user can perform handwriting input on the screen by pen **20** or a finger, when the icon for starting up the handwriting application software which is displayed on screen is touched by a finger or pen **20**, or when the specific button is depressed. Moreover, as shown in FIG. **1** (*c*), various software such as a camera application software for taking still picture, a video application software for taking movie, a voice memo application software for recording sounds, a calculator application software for calculating, an map application software map for searching and displaying etc. are installed in the handwriting input device **10**, and above-mentioned various software are called sub-application software generically. When the character and rough sketch to start up such sub-application software are input by handwriting with the pen **20** or fingers, the sub-application software concerned is started up and the use of the function for taking still picture or movie, for recording sound, for calculating or for searching on the map is attained.

FIG. **2** is a block diagram showing the composition of the main part of a handwriting input device **10** concerning the present embodiment. The handwriting input device **10** is composed with handwriting application software **11**, sub-application software **12**, Operating System **13**, a camera **14**, and microphone and speaker **15**. Moreover, the handwriting application software **11** is composed with a handwriting input section **11***a*, a predetermined input detection section **11***b*, a display section **11***c*, a reading section lid, inputted contents processing section **11***e* and an application software determining section **11***f*. And, the sub-application software **12** is composed with a controlling section **12***a*, a result processing section **12***b*.

The function of the handwriting input device **10** and the operation which were constituted as mentioned above are outlined. First, if a user writes by handwriting by pen **20** or a finger to the handwriting input section **11***a* (touch panel) of handwriting application software **11** which is started up as main application software, the contents of handwriting input is displayed on display section **11***c* (for example, Liquid Crystal Display is used). In that case, the predetermined input detection section **11***b* detects that there was a predetermined input (for example, the handwriting input with predetermined pen pressure or the handwriting input while specific button is depressed) in the handwriting input section **11***a*, the reading section **11***d* reads the information (contents of a handwriting input) displayed on display section **11***c*, inputted contents processing section **11***e* processes (for example, recognizing character and figure handwriting input, or specifying the size and the position of the area handwriting input) the read information. And the application software determining section **11***f* determines the sub-application software to start up based on the processed information, and notifies the determined software to operating system **13**.

The operating system **13** starts the corresponding sub-application software **12** or the function sections of camera **14** and microphone and speaker **15** combined with the sub-application software **12**, based on the received information.

The sub-application software **12** displays the controlling section **12***a* (for example, button for operating sub-application software **12**, etc.) on the display section **11***c*, and the sub-application software is operated according to the operation to the controlling section **12***a* by a user. And the result processing section **12***b* inserts the information (for example, in camera application software, the information is still picture and movie, in voice memo application software, the information is a record sound, in calculator application software, the information is a calculation result, in map application software, the information is a searched map.) acquired by the sub-application software into the display section **11***c* based on the information processed by the inputted contents processing section **11***e*.

In addition, in FIG. **2**, the handwriting application software **11** performs process for detecting a predetermined input, processing the inputted information, and for determining sub-application software which should be started up, on the other hand, the sub-application software **12** performs process for inserting the information acquired by sub-application software **12** into display section **11***c*. The composition in which other application software which operates on operating system **13** pet forms above-mentioned processes also suits the present invention (namely, handwriting application software **11** and sub-application software **12** are composed as in FIG. **2**, the other application software (handwriting input control program) which controls these application software is added.)

Next, basic process of handwriting input device **1** of this embodiment is explained with reference to the flow chart of FIG. **3**.

First, when the operation of stroke handwriting input is performed by user to handwriting input section **11***a* using pen **20**, a finger, etc. (S**101**), the display section **11***c* displays contents of a handwriting input on the screen (S**102**). Next, the predetermined input detection section **11***b* determines whether this handwriting input was performed on predetermined input conditions (S**103**). When the result is No, the process returns to S**101** and repeats the process from S**101** to S**103**. About the predetermined input conditions of the above S**103** is mentioned later.

On the other hand, when the result is in Yes, a reading section **11***d* reads the contents of a handwriting input (S**104**), and inputted contents processing section **11***e* performs a process which interprets the read contents of a handwriting input (S**105**), and the application software determining section **11***f* determines whether the sub-application software which is started from contents of a handwriting input can be specified (S**106**). When the result is No, the process returns to S**101**, in contrast, when the result is Yes, inputted contents processing section **11***e* saves processed contents of a handwriting input (S**107**), the application software determining section **11***f* notifies the sub-application software to start up to the operating system **13**, the notified sub-application software is started up by the operating system **13** (S**108**). About detailed process from S**104** to S**108** is mentioned later.

Next, the controlling section **12***a* is displayed on display section **11***c* by the started sub-application software, the sub-application software is operated by touch of the controlling section **12***a* by user (S**109**), and when an insertion result is determined (sub-application software acquires the information) (S**110**), the result processing section **12***b* reads out the contents of a handwriting input which is saved on S**107** and processes the information which is acquired by the sub-application software (S**111**), and the information is inserted in screen for handwriting input of display section **11***c* (S**112**). About detailed process from S**109** to S**112** is mentioned later.

In addition, although as the above-mentioned flow explained, the information which is acquired by sub-application software is inserted into screen for handwriting input of display section **11***c*, the example of other composition is explained that, a layout information is generated for inserting the information which is acquired by sub-application software into screen for handwriting input, the information which is acquired by sub-application software and the layout information are outputted, the information and the layout information are displayed on the display section of other device.

Hereafter, detailed process of the above-mentioned flow is explained with reference to a flow charts and a schematic diagram.

[Starting Up Process of Sub-Application Software]

The starting up process of sub-application software is explained with reference to the flow chart of FIG. **4**, and the schematic diagram of FIG. **5**. The detailed process of Steps S**104**-S**108** of FIG. **3** is explained. The specific character and picture (rough sketch) which is set by user are related to sub-application software, and are registered into database.

First, the reading section **11***d* reads out contents of a handwriting input as a reading-object (S**201**), the inputted contents processing section **11***e* performs character recognition to the read contents of handwriting input by OCR (Optical Character Reader) and a picture search to database. When character recognition by OCR is impossible (No of S**202**) and the read contents are not coincidence with picture which is registered to the database (No of S**203**), the sub-application software is not started up, but a state changes to the waiting for the handwriting input (S**204** which is same as S**101** of FIG. **3**).

On the other hand, when character recognition by OCR is possible (Yes of S**202**) (Yes of S**202**), inputted contents processing section **11***e* determines the possibility of recognition of parameters such as a position and size based on the contents of a handwriting input (S**205**). When recognition of parameter is impossible (No of S**205**), the sub-application software is not started up, but a state changes to the waiting for the handwriting input (S**204**). When recognition of parameter is possible (Yes of S**205**) or coincidence with picture which is registered to the database (Yes of S**203**), the application software determining section **11***f* checks whether there is sub-application software corresponding to the character recognized by OCR process or a rough sketch coincidence with the picture which is registered to the database (S**206**).

When there is no corresponding sub-application software, sub-application software is not started up, but a state changes to the waiting for the handwriting input (S**204**). On the other hand, when corresponding sub-application software is found, the inputted contents processing section **11***e* saves parameters, such as a position and size (S**207**), the application software determining section **11***f* notifies the sub-application software to start up to operating system **13**, and the operating system **13** starts up notified sub-application software (S**208**).

For example, if the character of "camera" as shown in FIG. **5** (*b*) is written by hand when the sub-application software is related to characters and pictures as shown in FIG. **5** (*a*), a character of "camera" is recognized by the character recognition of OCR, and sub-application software of camera is started up. Moreover, when a rough sketch as shown in FIG. **5** (*b*) is written by hand, the rough sketch is collated with the picture which is registered in the database. And since the details of the rough sketch and the picture related to camera application software are coincidence as a result of picture search, the sub-application software of camera is started up. Thus, the sub-application software of camera is started up only by operating of handwriting by user. Therefore, the convenience of user improves.

In the above-mentioned flow, although sub-application software is started up automatically based on the contents of handwriting, the example of other composition is explained that, the sub-application software which is recognized by application software determining section **11***f* is indicated by list and checked by user, in order to prevent starting up of the sub-application software which is not expected by user from owing to misconception of the contents of handwriting. The above-mentioned process is explained with reference to the flow chart of FIG. **6**, and the schematic diagram of FIG. **7**.

Like the above-mentioned flow, the target contents of a handwriting input is read by the reading section **11***d* (S**301**), the inputted contents processing section **11***e* performs picture search to database and character recognition by OCR to contents of a handwriting input. When character recognition by OCR is impossible (No of S**302**), and the picture registered to the database is not coincident with the contents (No of S**303**), sub-application software is not started up, but a state changes to the waiting for the handwriting input (S**304**).

On the other hand, when character recognition by OCR is possible (Yes of S**302**), the inputted contents processing section **11***e* determines the possibility of recognition of parameters such as a position and size based on the contents of a handwriting input (S**305**). When parameter is not recognized (No of S**305**), sub-application software is not started up, a state changes to the waiting for the handwriting input (S**304**). In contrast, when parameter is recognized (Yes of S**305**), or is coincident with the picture registered to database (Yes of S**303**), the application software determining section **11***f* checks whether there is any sub-application software corresponding to a character recognized by OCR or rough sketch which is coincident with the picture registered to database (S**306**).

When there is no corresponding sub-application software, sub-application software is not started up, and a state changes to the waiting for the handwriting input (S**304**). On the other hand, when corresponding sub-application software is found, sub-application software is started up in the above-mentioned flow, but in the present flow, the information (for example, sub-application software name) which specifies found sub-application software is displayed by list on handwriting input area on the display section **11***c* by application software determining section **11***f* (S**307**).

User determines whether to choose sub-application software from the list, or continue handwriting input (S**308**). Such process is performed because a candidate can be pared down by adding contents of a handwriting input when a plurality of sub-application software is displayed on list. And when continuing the handwriting input, process returns to the beginning of a main flow (S**309**), when sub-application software is chosen from the list, the inputted contents processing section **11***e* save parameters such as a position and size (S**310**), sub-application software to start up is notified to operating system **13** by application software determining section **11***f*, and operating system **13** starts up the notified sub-application software (S**311**).

For example, if the character of a "C" is written by hand as shown in FIG. **7**, the character "C" is recognized by character recognition of OCR. Next, database is searched, and sub-application software related to the character strings containing a "C" is displayed by list (In this example, since the character string containing a "C" is only camera, sub-application software of camera is displayed). And user chooses and starts up desired sub-application software from the list. Moreover, although not illustrated, also when a rough sketch is written by hand, the picture whose details correspond to the picture registered to database is search for, and sub-application software related to the picture is displayed by list. Thus, if user writes the character or rough sketch related to camera by handwriting, list of sub-application software corresponding to the handwriting is displayed, and if desired application software is chosen from the list, since selected sub-application software is started up, the sub-application software which is desired by user is started up certainly.

[Process for Inserting Result]

Next, inserting process (detailed process of Steps **S109**-**S112** of FIG. **3**) of the information acquired by sub-application software is explained. In this case, in parallel to process of Steps **S104**-**S108** of FIG. **3**, the process for setting up parameter is performed, wherein the parameter specifies a area which intercalates the information acquired by sub-application software (**S205** and **S207** of FIG. **4**, **S305**, **S307** of FIG. **6**).

As concretely shown in FIG. **8**, the reading section **11***d* reads target contents of a handwriting input (**S401**), and recognizes line (**S402**).

Next, the inputted contents processing section **11***e* recognizes area whose diagonal corresponds with the line, computes parameter (numerical value) which shows the size of a area in length and width (**S403**), and computes parameter (coordinates) which shows the position of a area (**S404**). Then, the inputted contents processing section lie saves parameters which show size and position (**S405**).

In this way, after setting up the area which should be inserted the result, as shown in FIG. **9**, the sub-application software is operated by user (**S501**) and the result of insertion is fixed (**S502**). For example, when operated sub-application software is camera application software, shutter (shot button) is operated and a picture is acquired, when operated sub-application software is video application software, since recording start/end button is operated and movie is acquired.

Next, the inputted contents processing section **11***e* reads out the parameter which is saved in **S405** of FIG. **8** (**S503**), performs a process related to the insertion size of the information which is acquired by sub-application software according to the read parameter (**S504**), performs a process related to the insertion position (**S505**). And, the result processing section **12***b* inserts the information acquired by application software according to the size and position of a place concerning insertion (**S506**).

This process is concretely explained using the schematically diagram of FIG. **10**. As shown in FIG. **10** (*a*), a handwriting area and its size are shown by the upper left starting point and the point of the lower right where X and Y coordinates are shown by (300, 200). When taking still picture, as shown in FIG. **10** (*b*), while user writes the character strings of "camera" by handwriting and writes an oblique line over the character strings by handwriting, the coordinates of the rectangle whose oblique line is diagonal are acquired, the direction of X of insertion size is set as 240, the direction of Y is set as 70, and the coordinates of an insertion position are set as (10, 30), and (250, 100). And when camera application software is started up based on the handwritten character strings of "camera", user depresses shutter button and takes still picture, the taken picture is processed into insertion size (the taken picture may be expanded/reduced according to insertion size, and the area which is insertion size may be cut out from the taken picture), and the processed picture is pasted on an insertion position.

Moreover, when taking movie, as shown in FIG. **10** (*c*), while user writes the character strings of "Video" by handwriting and writes an oblique line over the character strings by handwriting, the coordinates of the rectangle whose oblique line is diagonal are acquired, the insertion position and size are set based on the coordinates. And when video application software is started up based on the handwritten character strings of "Video", user depresses recording start/end button and takes movie, each picture which constitutes taken movie is processed to insertion size, and processed movie is pasted on an insertion position.

Moreover, in recording, as shown in FIG. **10** (*d*), while user writes the character strings of "microphone" by handwriting and writes an oblique line over the character strings by handwriting, the coordinates of the rectangle whose oblique line is diagonal are acquired. Here, in the case of a sound, since it is meaningless even if it specifies insertion size, display size is set constant, and volume is changed according to insertion size instead. For example, when insertion size (X multiplied by Y) and the estimate value of volume (db) are assumed like to be the states at the upper left of a FIG. **10**(*d*), since the insertion size is 240*70=16800, volume at the time of sound insertion is set to 16800/(60000/6 dB)=1.68 dB. And when voice memo application software is started up based on the handwritten character strings of "microphone", user depresses recording start/end button and records sound, and volume of recorded sound is processed into volume equivalent to insertion size, the play button is pasted on an insertion position and the processed sound is replayed by touching play button.

In addition, although the composition which the information acquired by sub-application software is inserted in the rectangle area which sets oblique line to diagonal is explained by the above, a curved line, a cross line, etc. become instead of oblique line which specifies a area and a rectangle area surrounding handwritten line may be set up as an insertion area, and a rectangle may be written by hand directly. Moreover, in the above-mentioned explanation, although the insertion area is specified by line, the insertion area may be specified by contents of a handwriting input. For example, as shown in an upper left table of the FIG. **10** (*e*), parameters of a display position sign or a keyword are assumed. And if both contents of a handwriting input and a display position sign (here upward arrow) are read, parameter (here, insertion in the position of tip of an arrow) corresponding to the read display position sign is specified, the information (here still picture) which is acquired by sub-application software may be inserted into the point of the arrow which is input by handwritten, according to this parameter.

That, the handwriting input for starting up the sub-application software and handwriting input (oblique line and display position sign) for setting up the area are performed, in order to avoid starting of the sub-application software by setting such handwriting input, although a user does not have the intention which starts up the sub-application software, when a user writes by hand the character or rough sketch which were related with sub-application software. However, if sub-application software is certainly started up when the character or rough sketch which is related with sub-application software is written by hand, an insertion area may be determined based on the handwriting input for starting up the

sub-application software. In that case, the rectangle area contents of a handwriting input may be determined as an insertion area, and the area (for example, area of the predetermined form of the upper part of an screen for handwritten input) of the predetermined position on the basis of the handwriting input may be determined as an insertion area.

As mentioned above, although camera application software, video application software, and voice memo application software are explained as an example of sub-application software, the case where the result calculated by calculator application software is inserted is explained with reference to the flow chart of FIG. **11**, and the schematically diagram of FIG. **12**.

First, reading section **11***d* reads target contents of a handwriting input (S**601**). Next, the calculation sign parameter is confirmed by character recognition process by OCR of the inputted contents processing section **11***e* (S**602**). When calculation sign parameter is not confirmed, calculator application software is not started up, but a state changes (S**101** of FIG. **3**) to the waiting for the handwriting input (S**603**). On the other hand, when calculation sign parameter is confirmed, the calculator application software is notified to operating system **13** by the application software determining section **11**, operating system **13** starts up the notified calculator application software (S**604**).

Next, on calculator application software, user confirms whether the contents of an input are O.K. (S**605**), when contents are not O.K., user operates reinputting on the calculator application software (S**606**). When the contents of an input are O.K., the calculation result is determined (S**607**). And like the above-mentioned, the process which determines insertion size and position is performed (S**608**), the calculation result is inserted according to the insertion size and position (S**609**).

For example, as shown in FIG. **12**, by character recognition of OCR, the calculation sign parameter (+−×÷/etc.) and the character are recognized based on the contents of a handwriting input. Here, "×" of a calculation sign parameter and "11.5" and "32.8" of a numerical value is recognized. And according to the calculation sign parameter (here "×"), calculator application software is started up, a calculation result is determined by touching the "=" button of calculator application software, and the calculation result "377.2" is inserted into the area specified by parameter of insertion size and point.

Next, the case where the map searched by map application software is inserted is explained with reference to the flow chart of FIG. **13**, and the schematically diagram of FIG. **14**.

First, reading section **11***d* reads the target contents of a handwriting input (postal code number, the name of a place, name of landmark, latitude, longitude etc.) (S**701**). Next, the inputted contents processing section **11***e* determines the map parameter by character recognition process by OCR (S**702**). When map parameter is not determined, the map application software is not started up, but a state changes (S**101** of FIG. **3**) to the waiting for the handwriting input (S**703**). On the other hand, when map parameter is determined, the map application software is notified to the operating system **13** by the application software determining section **11***f*, and the operating system **13** starts up the notified map application software, and circumference map and the photograph which includes the contents of an input on map application software are searched and displayed (S**704**).

Next, on the map application software, user confirms whether the contents of an input are O.K. (S**705**), when contents are not O.K., user operates reinputting on the map application software (S**706**). When the contents of an input are O.K., map search result is determined (S**707**). Then, like the above-mentioned, the process which determines insertion size and position is performed (S**708**), the map search is inserted according to the insertion size and position (S**709**).

For example, as shown in FIG. **14**, by character recognition of OCR, the postal code number, the name of a place, name of landmark, latitude, longitude and the character are determined. Here, a "〒" (this is the Postcode sign in Japan), a "192-8505" (an example of a postal code in Japan), a "2970, Ishikawa-cho, Hachioji-shi, Tokyo" are recognized. And when it is recognized that a keyword which shows the name of a place such as Postcode sign, a "prefecture", a "county" and a "city", a keyword which shows a landmark such as a "station", a "bride", and a "Ink.", and a numeric representation containing latitude and longitude, are contained in the inputted contents, the map application software is started up, circumference map and circumference photograph corresponding to the inputted contents are searched for and displayed on map application software. The user performs operation related to a scale of map and an angle of photograph, etc., and operation of change of the inputted contents on the map application software, and determines the map or the photograph to insert. And, the map or the photograph is inserted into the area specified by parameter of insertion size and point.

In addition, although the screen of sub-application software is displayed and the information which should inset is determined in the above-mentioned explanation, it is not necessary to display the screen of sub-application software. For example, in camera application software, while live preview screen of still picture and movie is not displayed, but still picture and movie which camera application software which is acquired automatically may be inserted. Moreover, in calculator application software, screen of calculator is not displayed, but the result which calculator application software calculated automatically may be inserted.

Moreover, in the above-mentioned explanation, in camera application software, video application software, or map application software, the display size of map is determined according to the size of a handwriting area, but the attribute of the information acquired by sub-application software may be determined with display size or instead of display size. For example, expansion/reduction magnification of a picture, the resolution of the picture, or playback time of the movie may be determined according to the size of a handwriting area (for example, the resolution is made high, or the playback time is lengthened according to the enlargement of expansion magnification). Moreover, in the voice memo application software, volume is adjusted according to the size of the handwriting area, but, recording time, sound quality, etc. may be determined with size of a handwriting area or instead of the volume (for example, the recording time is lengthened, or the sound quality is made high according to the enlargement of expansion magnification).

As mentioned above, the contents of a handwriting input are recognized automatically, the sub-application software is started up, but although a user does not have the intention which starts up the sub-application software, when a user writes by hand the character or rough sketch which were related with sub-application software. Then, an example of modification is that, sub-application software is started up only when the handwriting input is performed under some specific input conditions. A process (process of S**101**-S**103** of FIG. **3**) of handwriting input device **10** in the case of performing above control is explained.

For example, when handwriting input section **11***a* is touch panel of a pressure-sensitive type, as shown in FIG. **15**, a stroke handwriting input is performed to the handwriting

input section **11***a* by user (S**801**), the contents of a handwriting input is displayed on the display section **11***c* (S**802**). Next, the predetermined input detection section **11***b* determines whether this handwriting input is inputted by more than predetermined pen pressure (S**803**). If the pen pressure becomes under the predetermined value, it is determined that the handwriting input is usual, and return to S**801**, on the other hand, if the pen pressure becomes greater the predetermined value, it is determined as the starting up control of the sub-application software, and displayed contents of input data are read and processed.

Moreover, the specific button of handwriting input device **10** is provided, as shown FIG. **16**, stroke handwriting input is performed to handwriting input section **11***a* by user (S**901**), and the predetermined input detection section **11***b* determines whether specific button has been depressed (S**902**). When the specific button has not been depressed, it is determined that the handwriting input is usual, and return to S**901**, on the other hand, when the specific button has been depressed, it is determined as the starting up control of the sub-application software, the continuing contents of a handwriting input are considered as objects of reading. And if stroke handwriting input is performed to handwriting input section **11***a* by user (S**903**), the display section **11***c* displays contents of a handwriting input on the screen (S**904**), and displayed contents of input data are read and processed.

For example, if above-mentioned pen pressure (threshold) is assumed to be 250 g, and the character "ISP" of the upper part of FIG. **17** (*a*) is written with the pen pressure area which is 60 g-170 g, the starting up control of sub-application software is not performed by this handwriting input. On the other hand, if the character "camera" of the lower part of FIG. **17** (*a*) is written with the pen pressure area which is 255 g-320 g, the starting up control of sub-application software is performed by this input by this handwriting input, and the character "camera" is considered as objects of reading.

Moreover, if the character "ISP" of the upper part of FIG. **17** (*b*) is written when the specific button has not been depressed, the starting up control of sub-application software is not performed by this handwriting input. On the other hand, if the character "camera" of the lower part of right part of FIG. **17** (*b*) is written when the specific button has been depressed, or has once been depressed, the starting up control of sub-application software is performed by this input by this handwriting input, and the character "camera" is considered as objects of reading.

Thus, by starting sub-application software only when an input by hand writing is carried out under some specific input conditions (starting up), the starting without sub-application software meaning can be lose, and the convenience of user can be raised. Then, sub-application software is started up only when the handwriting input is performed under some specific input conditions, so that start process which is not intended by user is avoided, and a convenience for user is improved.

In addition, the present invention is not limited to the statement of the above-mentioned embodiment, and unless it deviates from the meaning of the present invention, the composition and control is changed suitably. For example, in the above-mentioned embodiment, the camera application software, video application software, the voice memo application software, the calculator application software, the map application software are explained as the sub-application software, the present invention is applicable similarly to other application software which is interlocked and operated with mainly application software (handwriting application software).

Easy starting up of application software and easy use of the information acquired by the application software concerned became possible, according to the handwriting input device and handwriting input control program of the present invention.

The reason is that, the handwriting input device (handwriting input control program) in which a handwriting input is possible to a touch panel which is superimposed on a display screen controls that, recognizing a content by the handwriting input and starting up application software according to an recognition result; setting up a area on the display screen based on an recognition result; inserting information acquired by the started application software into the set area and displaying on the display screen.

Since three operations, such as starting up of application software, determining of the insertion position and size of the information acquired by application software, inserting of the information acquired by application software can be performed in one operation by handwriting input, the time and effort of user can be saved and convenience can be raised.

What is claimed is:

1. A handwriting input device in which a handwriting input is possible to a touch panel which is superimposed on a display screen comprising:

an inputted contents processing section for recognizing a content by the handwriting input and setting up an area on the display screen based on a recognition result;

an application software determining section for determining an application software which should be started up based on the recognition result and starting up the application software; and

a result processing section for inserting information acquired by the started application software into the area and displaying on the display screen,

wherein the result processing section sets up an attribute of the information acquired by the application software according to a size of the area, and

wherein the attribute of the information comprises at least one of a resolution of an image, a recording time of a movie, and a recording time of a sound.

2. The handwriting input device of claim **1**, wherein the inputted contents processing section sets up a rectangle area specified by a line inputted by handwriting over a character and/or a figure which is inputted by handwriting, a rectangle area surrounding a character and/or a figure which is inputted by handwriting, or a rectangle area specified by a sign with a character and/or a figure which is inputted by handwriting, as the area.

3. The handwriting input device of claim **1**, wherein the application software determining section displays a list of application software which is determined based on recognition result on the display screen, and starts application software selected from the list.

4. The handwriting input device of claim **1**, further comprises an input detecting section for detecting a pen pressure by handwriting input or a state where a specific button is depressed,

wherein the inputted contents processing section, the application software determining section and the input detecting section are performed, when the pen pressure is higher than a predetermined threshold, when the specific button is depressed, or when handwriting is carried out after the specific button is depressed.

5. A non-transitory computer readable recording medium storing a control program which causes a handwriting input

device in which a handwriting input is possible to a touch panel which is superimposed on a display screen, execute a method comprising:

an inputted contents processing step for recognizing a content by the handwriting input and setting up an area on the display screen based on a recognition result;

an application software determining step for determining an application software which should be started up based on the recognition result and starting up the application software; and

a result processing step for inserting information acquired by the started application software into the area and displaying on the display screen,

wherein the result processing step sets up an attribute of the information acquired by the application software according to a size of the area, and

wherein the attribute of the information comprises at least one of a resolution of an image, a recording time of a movie, and a recording time of sound.

6. The non-transitory computer readable recording medium of claim **5**, wherein the inputted contents processing section sets up a rectangle area specified by a line inputted by handwriting over a character and/or a figure which is inputted by handwriting, a rectangle area surrounding a character and/or a figure which is inputted by handwriting, or a rectangle area specified by a sign with a character and/or a figure which is inputted by handwriting, as the area.

7. The non-transitory computer readable recording medium of claim **5**, wherein the application software determining step displays a list of application software which is determined based on recognition result on the display screen, and starts application software selected from the list.

8. The non-transitory computer readable recording medium of claim **5**, further comprises an input detecting step for detecting a pen pressure by handwriting input or a state where a specific button is depressed,

wherein the inputted contents processing step, the application software determining step and the input detecting step are performed, when the pen pressure is higher than a predetermined threshold, when the specific button is depressed, or when handwriting is carried out after the specific button is depressed.

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